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喜马拉雅——东南亚水龙骨科植物的分布中心*

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在讨论本文主题以前，有必要对喜马拉雅的地理范围首先做一简要说明。大家知道，喜马拉雅是举世闻名的陆地的一个最巨大的隆起。可是，它的地理范围究竟有多大，地质学家和地理学家们尚无一致的意见。不过，有一点是已肯定了的，即它的西北端起自阿富汗的东界和喀喇昆仑以南，向东偏南经过克什米尔、印度西北部、尼泊尔、锡金、不丹，又偏向东北到达我国西藏东南部的藏布（江）大拐弯处，这一段是通常公认的喜马拉雅。藏布江以东的山系算不算喜马拉雅、它的走向是向东北还是向东南、走得多远等等这一系列的科学问题尚无定论。不过，从植物地理和植物区系的角度看，雅鲁藏布（江）以东、北纬28°30'以南的横断山脉作为喜马拉雅山系的一部分的意见是可取的。本文作者对喜马拉雅的地理范围就是这样构思的。

在现代蕨类植物中，水龙骨科被认为是蕨类中最进化的一群植物，在系统发育史上，是代表着最后演化出来的一支。它分布于世界各地，以热带美洲和亚洲东南部为两大分布中心，后者包括印度次大陆、中国长江以南、印度支那、马来西亚、印度尼西亚、菲律宾和日本。在中亚、东北亚仅有一、二种零星分布，在西亚则尚无报道。喜马拉雅的蕨类植物，如同其它植物一样，从十九世纪二十年代后开始，一直吸引了西欧各国植物学家们的注意。近四十年来，特别是最近二十多年来，中国、日本和印度植物学家们开始对这个山区的蕨类植物的分类、形态、孢子和细胞等方面进行着较为深入的研究，但在植物地理学和植物区系学的研究尚待展开。本文只是对蕨类植物在这些研究领域的一个开端。关于其它植物群的地理工作将陆续报道。

到目前为止，喜马拉雅（主要是东部）的蕨类植物已知有43个科、105个属约550种，进入了世界蕨类最丰富区域的行列。就水龙骨科而言，已知有21个属120余种。在分析下列资料的过程中，人们不难看到，喜马拉雅可以认为是水龙骨科在东南亚的集中中心或分化中心，其中有些属显然是发源于喜马拉雅和邻近川滇边境，从此向各方面放射性地分布出去，特别是向东南方向远达马来西亚、印度尼西亚、菲律宾和日本。但可以认为也有不少属是由东南方迁移来的，并在新的地理条件下，演化出一些新属和许多特有

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种。这样，使亚洲东南部成为水龙骨科的一个世界分布中心。

1.瓦苇属——Lepisorus(J.Sm.)Ching

瓦苇属是根据日本和我国东部的瓦苇（Polypodium lineare Thunb.）这个种建立的，是水龙骨科的一个大属[1]，现知有60余种，主要集中分布在喜马拉雅和川滇边境，向东南到印度支那，向南经印度南部到马达加斯加和非洲中部（约6—7种）；亚洲中部（天山北坡）和东北部各有1种，俄国植物学家在1881年叫作Polypodium alberti Regel，初步认为就是喜马拉雅常见的网眼瓦苇Lepisorus clathratus，向东也到日本和我国台湾。在东北亚的1种，乌苏里瓦苇(Lepisorus ussnriensis)，除产于我国东北三省外，还分布于朝鲜、日本北部和苏联远东地区。喜马拉雅以西地区，没有本属的代表，这显然由于西北亚的气候已属于干旱的大陆气候型，不适于本属植物的生存的缘故。有趣的是菲律宾、夏威夷和Sandwich群岛各有1种。

2.骨牌蕨属——Lepidogrammitis Ching

骨牌蕨属是根据我国长江流域的骨牌蕨（Polypodium microphyllum Bak.）建立的，约有8种，几乎全部产于中国，其中3种分布于喜马拉雅，1种到日本，另1种[2]到我国台湾，2种到印度支那和缅甸。在形体上，本属最近瓦苇属，但根状茎细长如铜丝，绿色，几光滑（有极少数鳞片），叶二型或近二型，肉质，脉型也不同，故易区别。

3.盾蕨属——Neolepisorus Ching

盾蕨属是根据最初在尼泊尔喜马拉雅发现的盾蕨（Polypodium ovatum Wall.）建立的。现知有8种。除非洲马达加斯加和日本各有1种外，均产我国长江流域和华南。本属的模式种也分布于印度北部，缅甸北部、泰国、印度支那和菲律宾。

4.扇蕨属——Neicheiropteris Christ

扇蕨属是根据云南的扇蕨（Polypodium palmatopedatum Bak.）建立的，是我国特有的蕨属，仅有2种，一产云南中部和东南部，一产我国西藏喜马拉雅[3]，都是比较稀见的植物，它的特征是叶片掌状或指状分裂，孢子囊群在裂片中肋两侧各排成1行，幼时也有伞状隔丝复盖。

5.毛鳞蕨属——Tricholepidium Ching

毛鳞蕨属是个前不久提出的新属，是根据尼泊尔喜马拉雅的毛鳞蕨（Polypodium

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〔1〕有些学者，如E.B.Copeland和Pichi Sermolii，把本属归并于主产美洲热带的Pleopeltis属，其实这个属，除不同的地理分布区外，在形态和脉型都不同，不能混为一谈。

〔2〕**Lepidogrammits diversa** (Rosenst.) Ching, comb. nov.—Polypodium diversum Rosenst. in Hedwigia 56: 346.1915—Lemmaphyllum christensenianum Ching in Bull. Fan Mem. Inst. Biol. 4: 98. 1933.

〔3〕N.waltonii Ching 特产于西藏，据最近研究，可能代表一个特有属，将另文发表。

normale Don) 建立的，约有10种，几乎全都产于喜马拉雅，只有1种自云南东南部向南分布到印度支那、马来西亚、印度尼西亚，另1种特产于越南北部。

6.星蕨属——Microsorium Link

星蕨属是根据广布于亚洲热带的星蕨 Polyoodium punctatum L. 建立的，约有40种，主要分布于东南亚，喜马拉雅有10余种，非洲也有。本属植物大都为附生，少有土生。叶片单一或羽裂，不具锯齿，孢子囊群圆形，往往多少融合，满布叶下面（少有在中肋两侧各成1行），不具隔丝。

7.瘤蕨属[1]——Phymatodes Presl[2,3]

瘤蕨属是根据东南亚热带的瘤蕨Polypodium phymatodes L.建立的，Presl把林奈的双名改为Phymatodes vulgaris Presl，现在叫作 Phymatodes scolopendria (Burm.) Ching 都是指一种植物。现知约有10种，均产热带亚洲，喜马拉雅有1种，光亮瘤蕨(Phymatodes cuspidata (Don) Alston.

8.假瘤蕨属[4]——Phymatopsis J.Sm[5]

假瘤蕨属是根据亚洲带的假瘤蕨Polypodium Palmatum Bl.建立的，现知约有70种，分布于亚洲热带和亚热带，主产于大陆，以喜马拉雅为分化中心。

9.节肢蕨属——Arthromeris Moore

节肢蕨属是根据喜马拉雅的节肢蕨 Polypodium wallichianum Sprenger 建立的，约有14种，以喜马拉雅为发展中心，向东经我国长江流域到日本和我国台湾，向南到泰国、越南北部、缅甸北部、菲律宾也有1种，名称未定。本属不同于以上几个属之点在于，它有奇数羽状的叶片，羽片以关节着生于叶轴，边缘具有半透明的软骨质，是一个突出的属。

10.石苇属——Pyrrosia Mirbel

石苇属是根据日本和我国东南部的石苇 Polypodium lingum Thunb. 建立的，有100余种，主要产于东南亚各地，非洲和中美洲也有少数种分布，喜马拉雅有10余种，长江

〔1〕本属原称弗蕨，在《中国高等植物图鉴》第一册改为"密网蕨属"，二者都欠确切，现根据希腊词原意——肿瘤，指孢子囊群在叶上面为瘤状突起之意——改为今名。

〔2〕Copeland在Genera Filicum中，把本属归并于Microsorium，其实差别是很大的。

〔3〕Pichi Sermolli (Webbia 48, 457. 1973) 提出一个新属名，Phymatosorus代替 Phymatodes Presl是多余的，因为Phymatodes Presl是根据Polpodium phymarodes L.建立的，上面已经说明了。

〔4〕本属原名假弗蕨属，在《中国高等植物图鉴》第一册改为"假密网蕨属"，二者都欠确切，改为今名，理由同瘤蕨属。

〔5〕Pichi Sermolli (Webbia 28: 46. 1973) 提出一个新属名，Phymatopteris代替Phymatopsis J.Sm，是多余的，如果确有必要，可以作为保留属名，不必另立新属名。

以北只有少数几种，东北亚有2种，西亚和中亚没有本属的代表。

11.丝带蕨属——Drymotaenium Makino

丝带蕨属是根据日本的丝带蕨D. miyoshianum (Mak.) Mak.建立的，是单种属，它从华东各省（包括台湾省）经长江流域分布到四川、云南，近来也在西藏东南部（察隅）发现。这是很有意义的分布格局。

12.线蕨属——Colysis Presl

线蕨属是根据喜拉雅的线蕨Polypodium hemionitideum Wall.建立的，约有50余种，大都分布于亚洲热带和亚热带，马来西亚、印度尼西亚和非洲也有少数几种，而属的模式种则广布于整个东南亚大陆，向东到日本、菲律宾和我国台湾。

13.戟蕨属——Christiopteris Copel.

戟蕨属是根据菲律宾吕宋岛的戟蕨 Polypodium sagittatum Christ 建立的，现知有3种。其中第二种产于南太平洋的新喀里多尼亚，第三种产于喜马拉雅，向东南经缅甸到印度支那和我国广东海南岛。

14.薄唇蕨属[1] **——Leptochilun** Kaulf. sen. lat.

薄唇蕨属是根据菲律宾吕宋岛的薄唇蕨L. axillaris (Cav.) Kaulf. 建立的，约有10种，广布于热带亚洲，喜马拉雅有4种（包括属的模式）。从本属分立的拟薄唇蕨属Paraleptochilus Copel.也产喜马拉雅。

15.尖嘴蕨属——Belvisia Mirbel

尖嘴蕨属是根据非洲的尖嘴蕨Acrostichum spicataum L. fil.建立的，约有15种，广布于亚洲热带。如马来西亚、印度尼西亚、新几内亚、菲律宾、我国西南部，在喜马拉雅也有1种——B. henryi (Hieron.) Tagawa。

16.伏石蕨属——Lemmaphyllum Presl

伏石蕨是根据菲律宾吕宋岛的伏石蕨 L. spathulatum Presl 建立的，仅有4个相近的种，分布于喜马拉雅地区，以及缅甸、泰国、印度支那、我国南部和东南部（包括台湾省），日本也有。

17拟瓦苇属——Paragramma Moore

本属是根据印度尼西亚的拟瓦苇 Polypodium longifolium Bl.建立的，仅有2种，分布于菲律宾、印度尼西亚、马来西亚、印度支那、缅甸和尼泊尔西部 (Kumaon)。

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〔1〕本属原名莱蕨属，在《中国高等植物图鉴》第一册中改为“网囊蕨属”，二者都欠确切，现根据希腊词原意改为今名。

本属体形像瓦苇，但叶脉和表皮组织不同，孢子囊群长圆形或线形，生于靠近叶边的凹穴中。

18.抱树莲属——Drymoglossum Presl

抱树莲属是根据印度的抱树莲（D.pilloselloides (L.) Presl）建立的，约有6种，分布于亚洲热带和非洲马达加斯加。肉质抱树莲（D.carnosum(Wall.)Presl）广布于尼泊尔、锡金、不丹、喜马拉雅、缅甸，向南到泰国、印度支那。

19.水龙骨属[1]——Polypodiodes Ching

水龙骨属这个新属是根据最初在尼泊尔喜马拉雅发现的友水龙骨 Polypodium amoenum Wall.建立的，约有16种，主产喜马拉雅，向东经缅甸、中国西部、中部到东部（台湾省），日本和印度支那各有2种。

过去，本属的成员一直归入欧亚和北美的多足蕨属（Polypodium L.），但除了不同形态性状外，地理分布也截然不同。多足蕨属（Polypodium L.）分布于欧、亚、美三洲的温带，不产亚洲的亚热带，在中国仅产于新疆的阿尔泰山和东北亚（我国吉林、黑龙江；朝鲜、日本和苏联远东地区）。它的许多形态性状（包括分离叶脉）完全不同于我国亚热带的水龙骨属的，应分为两属。

20.拟水龙骨属——Polypodiastrum Ching

拟水龙骨属也是不久前提出的新属，是根据喜马拉雅常见的拟水龙骨（Polypodium argutum Wall.）建立的，约有8种，产于喜马拉雅和四川、云南、贵州、广西、台湾；日本、印度支那和大洋洲各有1种。

21.篦齿蕨属——Metapolypodium Ching

篦齿蕨属也是不久前提出的新属，是根据最初在云南发现的篦齿蕨（Polypodium manmeiense Christ）建立的，现已知分布于印度支那、泰国、缅甸北部和锡金喜马拉雅，向北到四川西南部。最近，又在云南东南部（金平县）发现第二种。

结　论

从上面的分析可以清楚地看到，在整个东南亚的现知水龙骨科的大约30个属中，喜马拉雅（主要在东部）有21个属，约占总属数的三分之二强。在植物地理的文献中，一个科的属能够达到这样的高度集中在一个比较不大的地区，还是罕见的。

另一方面，在这些属中，有些显然是从东南亚其它地区迁移来的，最明显的有瘤最

水龙骨是我国本草中的药用植物，在分类学上过去归入欧洲水龙骨属（Polypodium），其实很不相同，已分立出来另成一新属，拉丁名叫Polypodiodes，汉名不变，以存其真。至于属名 polypodium 的汉译，按照希腊词原意，改为多足蕨属。

属、星蕨属、抱树莲属、拟石苇属等，但其它许多属可以认为是喜马拉雅和邻近的川滇边界起源或发展起来的，其中最明显的有：瓦苇属、骨牌蕨属、毛鳞蕨属、假瘤蕨属、节肢蕨属、线蕨属、石苇属、崖姜属、水龙骨属、拟水龙骨属、蓖齿蕨属等。这些属的一些成员在植物区系历史发展过程中，可能由此向各方面放射出去，向东经中国西南部、中部到东部（包括台湾省）和日本，少数到菲律宾，向东南经缅甸、泰国、印度支那到马来西亚、印度尼西亚，向南经印度南部到马达加斯加和非洲大陆。其中迁移得最远的要算瓦苇属，它的一种网眼瓦苇Lepisorus clathratus或者近亲种向北分布到亚洲中部（天山），东北亚也有一个地理代替种（Lepisorus ussuriensis），菲律宾有1种，太平洋中的夏威夷、Sandwich群岛也各有1种，非洲有6、7种。有趣的是，马来西亚和印度尼西亚迄今未发现有瓦苇属的代表。假瘤蕨属是第二个集中分布在喜马拉雅的大属。它的成员也广布于马来西亚、印度尼西亚和其它太平洋的岛屿。其它各属都没有表现这样的分布格局，即使分布区集中于喜马拉雅地区的毛鳞蕨属 Tricholepidium 的成员，也仅有Ⅰ个地理代替种，即斑点毛鳞蕨(Tricholepidium maculosum (Christ)Ching)，从云南东南部经印度支那到达马来西亚、印度尼西亚，和沙坝毛鳞蕨（T.chapaense (Tard.-Blot)Ching)，特产于越南北部。

由此可见，我们说喜马拉雅（主要是东部）是东南亚水龙骨科植物的汇集中心是有充分根据的。可以预言，随着今后在藏布江以东的喜马拉雅植物调查的进一步开展，还有更多的水龙骨科植物将被发现，使目前的结论得到进一步加强。

THE HIMALAYA AS A CENTRE OF CONCENTRATION FOR THE SOUTH-EASTERN ASIATIC POLYPODIACEOUS FERNS

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SUMMARY

Before summing up the essential points brought forward in the present paper, it seems desirable at the outset to circumscribe briefly the geographical boundary of the Himalaya. We all know that the Himalaya is an extraordinarily gigantic upheaval of the landmass in the world, yet, up to the present, geologists and geographers are still divided in the concept of its geographical boundary. It has so far unequivocally been recognized that the mountain range west of the great bend of the famous Tsangpo Gorge in southeastern Tibet running

northwestwardly as far as the eastern boundary of Afghanistan and south of the Karakurun is the Himalaya proper, while the mountain range east of the Tsangpo Gorge remains in controversy as to its status. Some geologists have considered it to be an eastern extension of the Himalaya proper, while others have denied such a proposition. Among those accepting the first hypothesis are, however, also divided in opinion regarding the direction of the range—whether due NE or due SE, and how far its course runs in either one of the two directions at all. All these problems remain to be solved through further intensive explorations in the region. From the floristic and phytogeographical viewpoint, however, it seems that the first hypothesis appears more plausible, and this is, indeed, the attitude of the present writer towards the geographical bonudary of the Himalaya, i.e. to the east it is construed as including the watersheds of the parts (south of 28° 30′ Lat. N.) of the Dulong Jiang River (Irrawadi), Nu Jiang River (Salween), Lancang Jiang River (Mekong) and Jinsha Jiang River (the upper Yangzi Jiang River) in the northern parts of Burma, Assam and the northwestern part of Yunnan in West China.

In the past one century and half the fern flora of the Himalaya has been quite extensively studied in taxonomy, morpho-anatomy, cytology and recently Palaeontology, but the field of phytogeography as a whole has so far been scarcely touched. The present paper may, therefore, be considered as a first attempt in this direction.

To sum up the information brought together in the foregoing pages, it shows that out of a total of ca. 30[1-2] genera of the family *Polypodiaceae* (sens. str.) in the whole of southeastern Asia[2] are now represented in the Himalaya (mainly in eastern part). This must be considered as a very high concentration of the number of genera for a family in a relatively not very large area like that of the Himalaya.

On the other hand, an analysis of these genera seems to indicate that a number of them are immigrants from the other parts of southeastern Asia and Africa, especially from the Indo-Malesia and Polynesia, among them may

〔1〕 The tropical American genus *Pleopeltis* Humb. et Bonpl. is represented only by the cosmopolitan species *P. lanceolata* complex as reported from South India by Beddome. This is an immigrant from Africa. Copeland and lately Pichi Sermolli have united *Lepisorus* (J. Sm.) Ching to *Pleopeltis*, using the latter name for both. In fact, the two genera are very distinct by a number of important characteristics, apart from distinct geographic areas, as already pointed out in my previous paper.

〔2〕 *Schellolepis* J. Sm. has one wide-spread species, *S. subauriculata* (Bl.) J. Sm. in tropical Asia ranging northwardly over to Khasya in India but has never been recorded as reaching rhe Himalaya.

mention *Phymatodes*[1] *Microsorium, Leptochilus, Belvisia, Drymoglossum, Paragramma* and perhaps a few others. However, the majority of the genera seems to be originated along the border of Yunnan and Szechuan and later with the Himalaya as the centre of development, notably for such genera as *Lepisorus, Neolepisorus, Lepidogrammitis, Tricholepidium, Arthromeris, Pyrrosia, Phymtopsis*[2], *Colysis, Polypodiodes, Polypodiastrum* and *Metapolypodium*. Hence the members of these genera in the course of evolution have radiated as far as Japan and our Province Taiwan and even to the Philippines in the east, and through Burma, Thailand to Indo-China, Malesia and Polynesia in the southeast. Southwardly, the genera such as *Lepisorus, Neolepisorus, Pyrrosia* and possibly *Drynaria* are ranging through South India over to Madagascar and Africa mainland. A very striking instance is observed in the genus *Lepisorus*, of which one Himalayan species (*L.clathratus*)[3] is ranging northward disjunctly as far as the West and East Tien-Shan in Central Asia and a vicariant species(*L. ussuriensis*)in extreme northeastern Asia. From the Pacific Islands Hawaii and Sandwich one species each has been reported, besides one in the Philippines. In Africa there are half dozen species of this genus. No other Himalayan genera of the *Polypodiaceae* exhibit such a peculiar distribution pattern. Another typically Himalayan genus is the recently segregated *Tricholepidium*, which is now known as having 10 species all endemic to the eastern Himalaya except one outlying species, *T.chapaense* in northern Vietnam and another, *T. maculosum* in southeastern Yunnan, hence the latter ranges over Indo-China, Thailand, Malesia to Indonesia. *Polypodiodes*,[4] a new segregate from the composite genus *Polypodium* L. (sens. lat.), is based on the classical Himalayan fern, *Polypodium amoenum* Wall., which differs from *Polypodium* L. (sens. str.) in many respects as diagnosed elsewhere[3] As construed now the genus has about 16 species, mostly Himalayan

[1] Pichi Sermolli has recently proposed a new generic name, ***Phymatosorus*** to replace ***Phymatodes*** Presl. We all know that the type of the genus ***Phymatodes*** Presl is and must ***Phy. vulgaris*** Presl, which was ***Polypodium phymatodes*** L., now ***Phy.scolopendria*** (Burm.) Ching. There is no ambiguity about the status of ***Phymatodes*** Presl as a legitimate name to require a new name for it.

[2] Again, Pichi Sermolli has proposed a new generic name, ***Phymatopteris*** in place of ***Phymatopsis*** J. Sm., because there is an older homonym ***Phymatopsis*** Tulasne ex Trev, a genus of ***Ascomycetes***, which was, however, considered as a synonym to ***Abrothalus*** De Not and never used since its publication. If necessary, ***Phymatopsis*** J. Sm. could be proposed as nomen conservandum. There is no taxonomical necessity calling for a new generic name at all. ***Phymatopteris*** Pichi Serm. therefore, considered as a superfluous name.

[3] A species complex requiring further study.

[4] Acta Phytotaxonmica Sinica 16: 17. 1978.

with two species ranging eastwardly over to Japan and our Province Taiwan. *Polypodiastrum*[1] another new segregate from *Polypodium* L. (sens. lat.), is based upon another classical Himalayan fern, *Polypodium argutum* Wall. which is distinct from *Schellolepis* J. Sm. in some essential characteristics as diagnosed elsewhere[1] The genus has about 10 species in the Himalaya and the interior part of China, and one species in Japan and our Province Taiwan respectively. One outlying species[1] occurs on the Pacific island Perak. The type of the genus is widely dispersed in Burma, Thailand, Indo-China, Malesia and the Philippines. *Metapolypodium*,[3] The third segregate from the composite genus *Polypodium* L. (sens. lat.) is so far represented by only two species, of which the generic type, *M. manmeiense* (=*Polypodium manmeiense* Christ), first recorded from Yunnan, is now found wide-spread in Indo-China, Thailand, northern Burma and the Sikkim Himalaya. The second species of the genus, *M. kingpingense*, is known only from south-eastern Yunnan at the present, which closely resembles *Thalacopteris papillosa* (Bl.) Kze.

It is interesing to note that very few polypodiaceous ferns from the east and central Himalayas arrive in the extreme northwestern Himalaya. This is apparently due to the very arid continental climate there.

From the above we can see clearly that the Himalaya (mainly the eastern part) has the credit of being a centre of concentration for the polypodiaceous ferns in southeastern Asia, and, in fact, many genera of the family are very likely originated in the Himalaya and especially its neighbourhood of Yunnan and Szechuan borderland.

Our present knowledge of the polypodiaceous fern flora of the Himalaya is, however, still in an imperfect state. With the progress of more extensive field work there, especially in the areas east of the great Tsangpo Gorge, it is to be expected that more additional ferns of the family will be discovered.

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[1] Polyodiastrum prainii (Bedd.) Ching, comb. nov. —*Goniophlebium prainii* Bedd. in Journ. of Bot. 1893: 226—*Polypodium prainii* (Bedd.) C.Chr. Ind. Fil. 556. 1906.